

# Managing Threats to the Tankerhoosen River Watershed: A Plan for Protecting Its Water Quality and Ecological Health

February 26, 2009

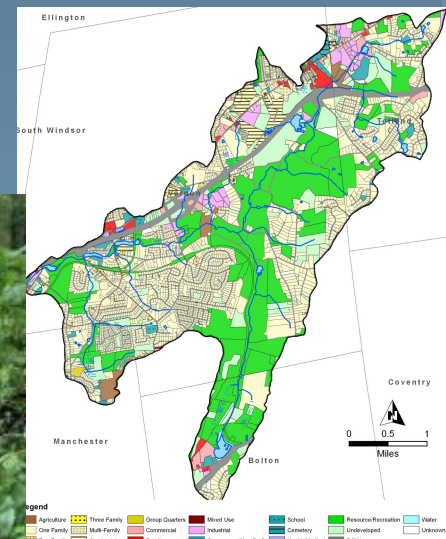
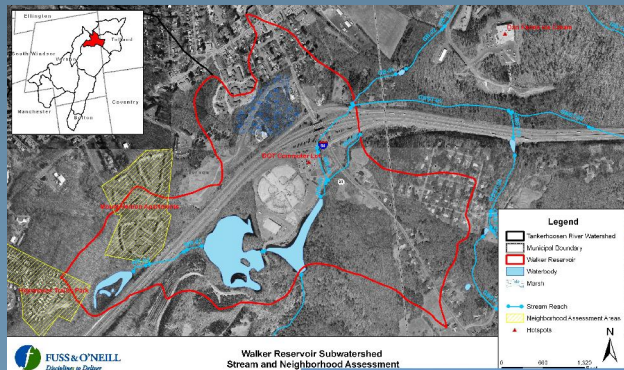
*Sponsored by:*  
Friends of the Hockanum River Linear Park, Inc.  
North Central Conservation District  
Town of Vernon  
Rivers Alliance of Connecticut  
Hockanum River Watershed Association  
Belding Wildlife Trust



**FUSS & O'NEILL**  
*Disciplines to Deliver*

# Purpose of Tonight's Meeting

- Present the results of a multi-year study and planning process for the Tankerhoosen River watershed
- Highlight the management plan recommendations
- Get feedback from the public



# Presentation Outline

- Project Background
- The Tankerhoosen – A Key Inland Watershed
- The Need for a Comprehensive Watershed Plan
- Plan Development Process
  - *Baseline Assessment*
  - *Watershed Field Inventories*
- Watershed Management Goals and Objectives
- Management Plan Recommendations

# Project Team

- Project Partnership
  - *Friends of Hockanum River Linear Park*
  - *North Central Conservation District*
  - *Belding Wildlife Trust*
  - *Town of Vernon*
  - *Hockanum River Watershed Association*
  - *Rivers Alliance of Connecticut*
- Technical Advisory Committee
- Fuss & O'Neill



# Project Funding

- Total Project Cost = \$123,000
- National Fish and Wildlife Foundation
- Town of Vernon
- Belding Wildlife Trust
- Rivers Alliance
- New England Grassroots Environment Fund
- In-Kind Labor
  - *North Central Conservation District*
  - *Hockanum River Watershed Association*
  - *Friends of the Hockanum River Linear Park, Inc.*

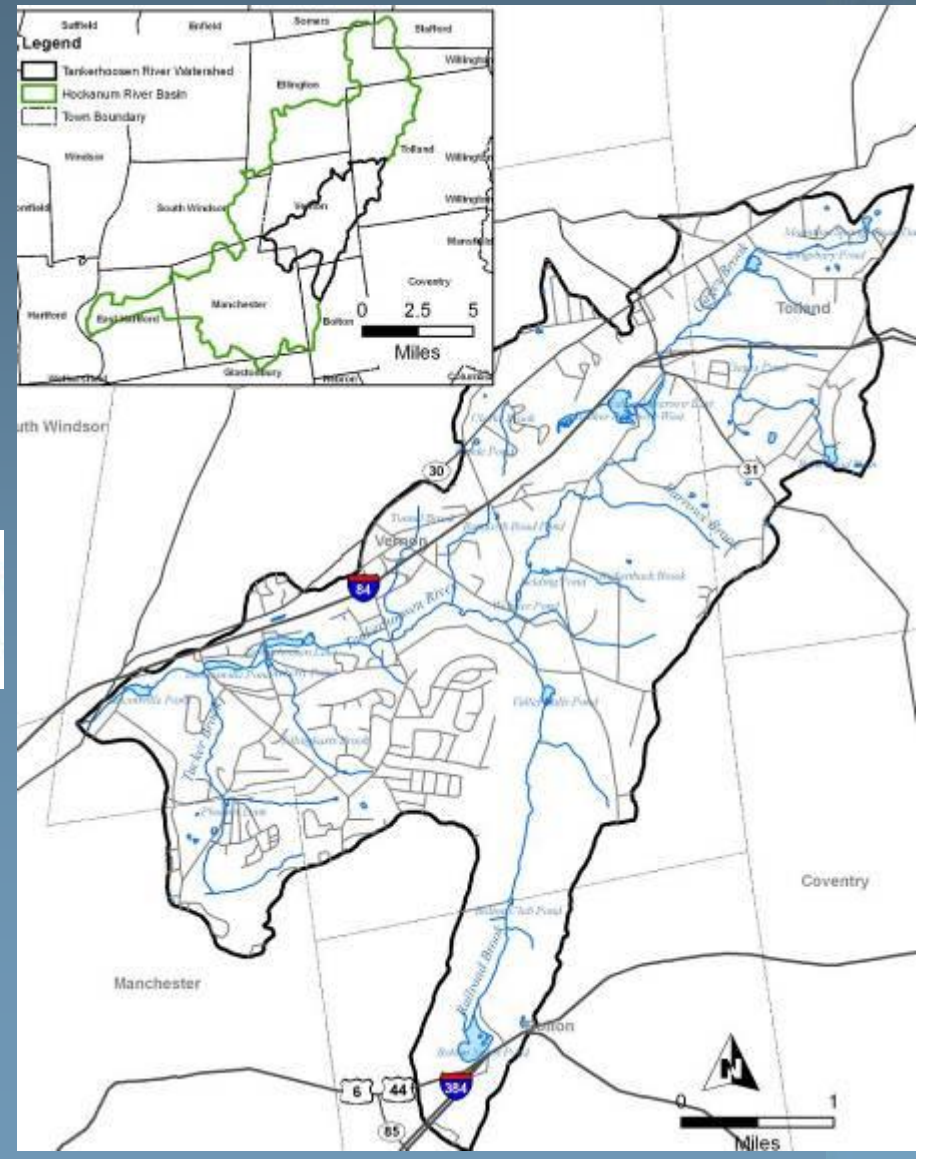


# The Tankerhoosen – A Key Inland Watershed

- 12.9 square miles in 4 towns
- High-quality cold water stream
- One of two Class I wild trout management areas east of Connecticut River



- Headwater stream, critical to the health of LI Sound
- Importance of protecting the Tankerhoosen recognized by local/state agencies, TNC, and others



# Potential Threats

- Development pressure in headwaters region
  - *I-84 Exit 67*
  - *Tolland Industrial Park*
  - *Interstate 84*
- Water quality impacted in lower reaches
  - *Cited as impaired by DEP*
  - *Nonpoint source runoff, stormwater*



# The Need for a Comprehensive Plan

- Recognized need to consider environmental consequences of future development within the Tankerhoosen watershed
  - *Watershed towns*
  - *Local advocacy groups*
  - *CTDEP*
- Address immediate and long-term threats to water quality and natural resources
- Develop and implement a comprehensive, scientifically-based, watershed management plan

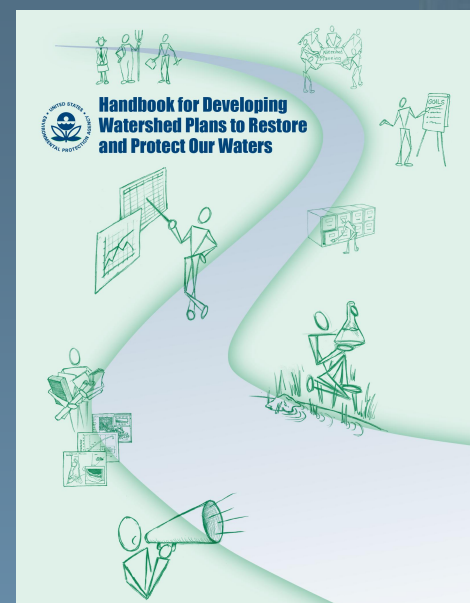


# Watershed Management Goals

1. Develop an affordable and effective plan
2. Maintain and enhance water quality and ecological health of the Tankerhoosen
3. Protect the upper regions of the watershed from existing pollutant sources and future threats (protection)
4. Restore and enhance water quality and ecological health of impacted portions of the watershed (restoration)

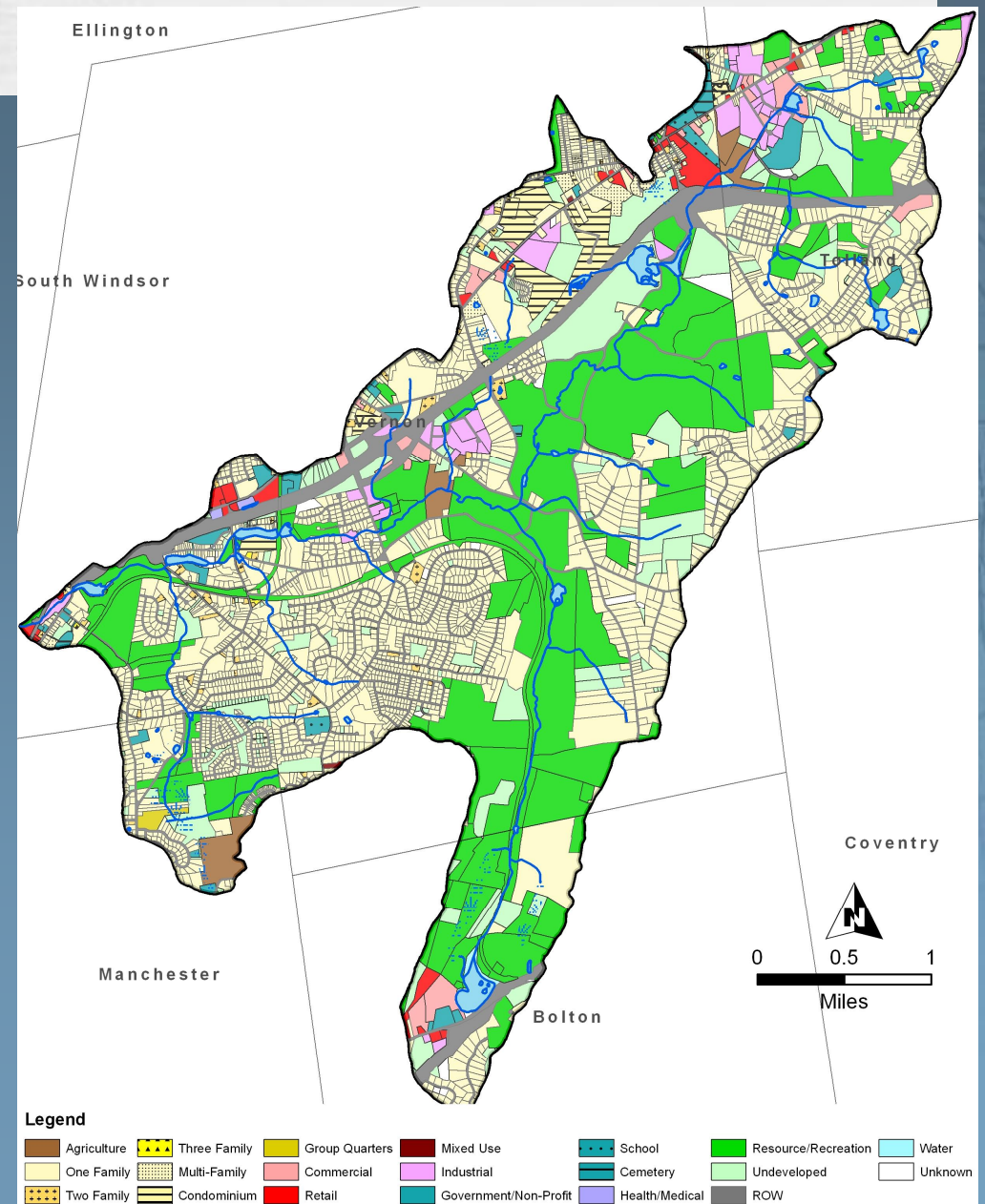
# Plan Development Process

- EPA Guidance for Watershed-Based Plans
  - *Nine elements*
  - *Enables implementation projects to receive funding under Section 319 of Clean Water Act*
- Major Tasks:
  1. *Baseline watershed assessment*
  2. *Land use regulatory review*
  3. *Field inventories of stream corridor and upland areas*
  4. *Identification of management goals and objectives*
  5. *Development of management plan recommendations*



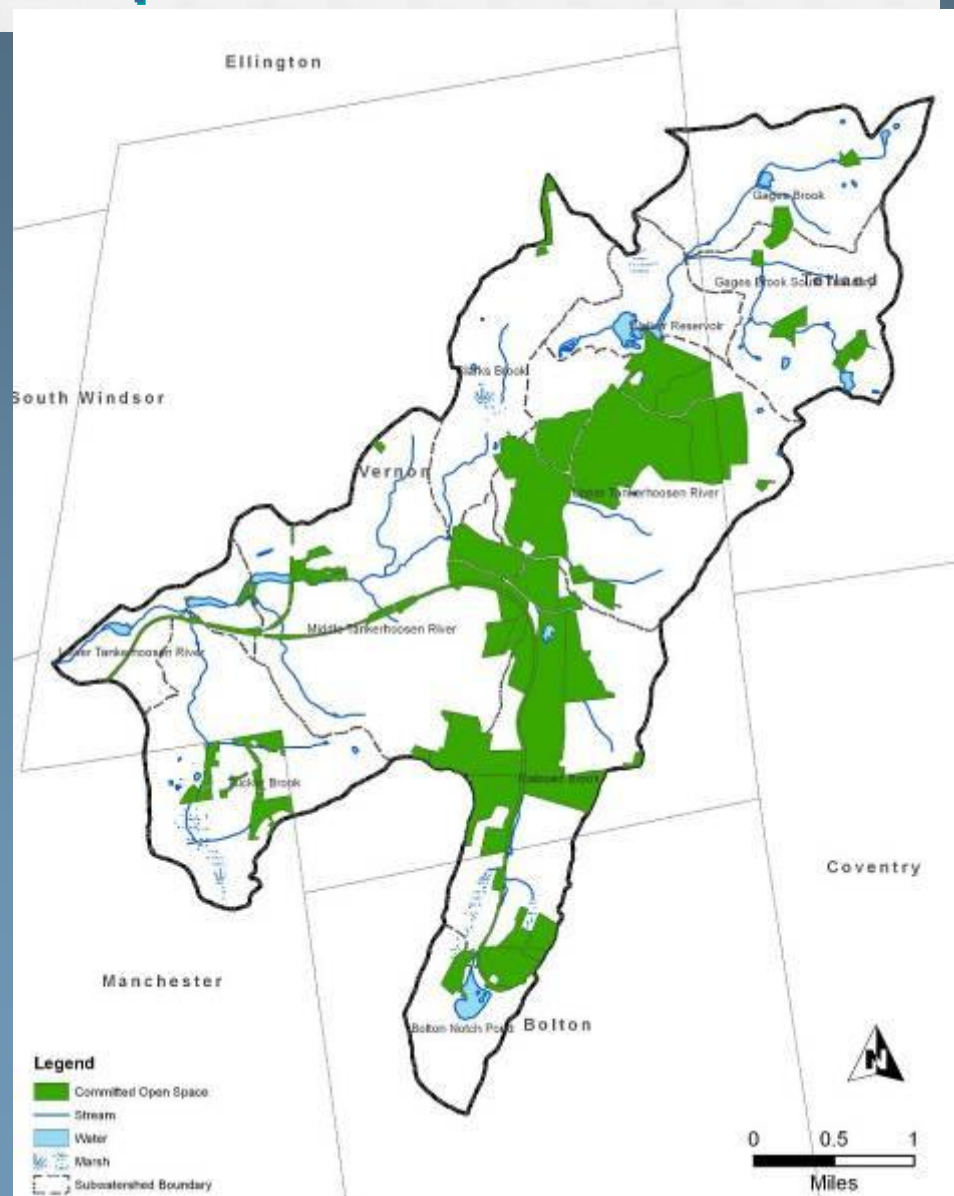
# Land Use

- CRCOG Land Use (2003)
- 60% developed land use (40% residential)
- 4% commercial and industrial
- 9% roads and highway
- 30% committed and uncommitted open space



# Protected Open Space

- CRCOG Land Use
- Confirmation by Vernon and Bolton representatives
- Manchester and Tolland POCD
- Deeded open space privately owned
- Land trusts
- State land
- Town park land

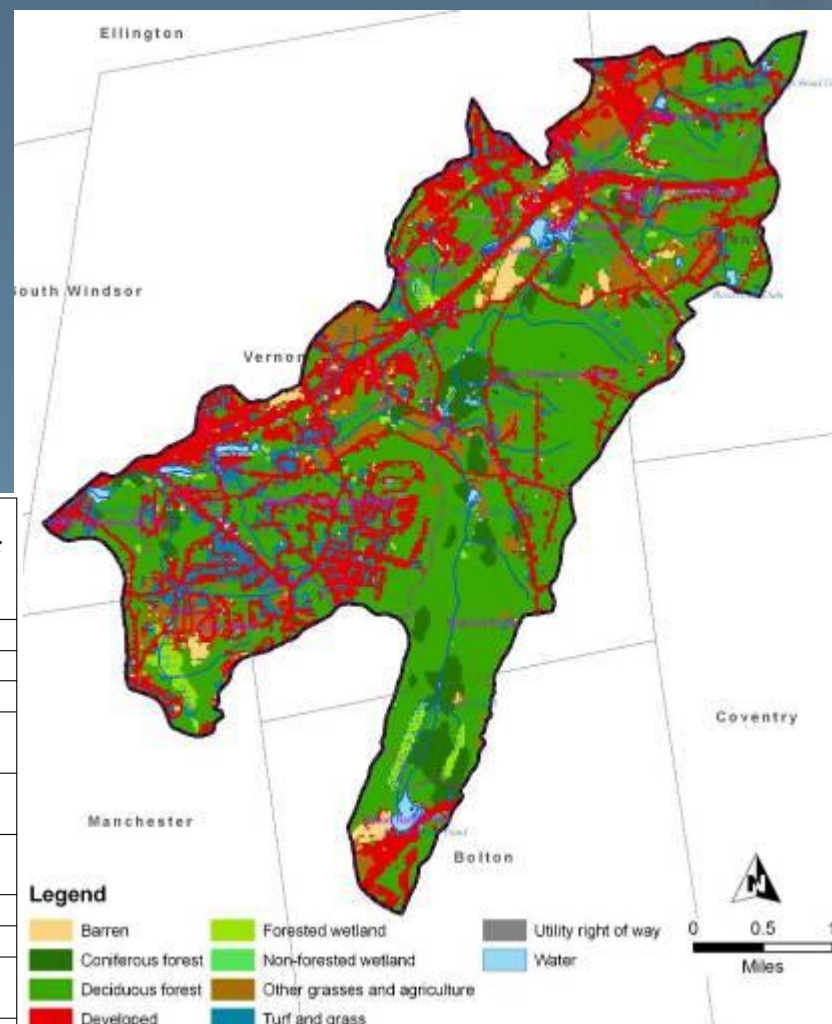




# Forest Cover

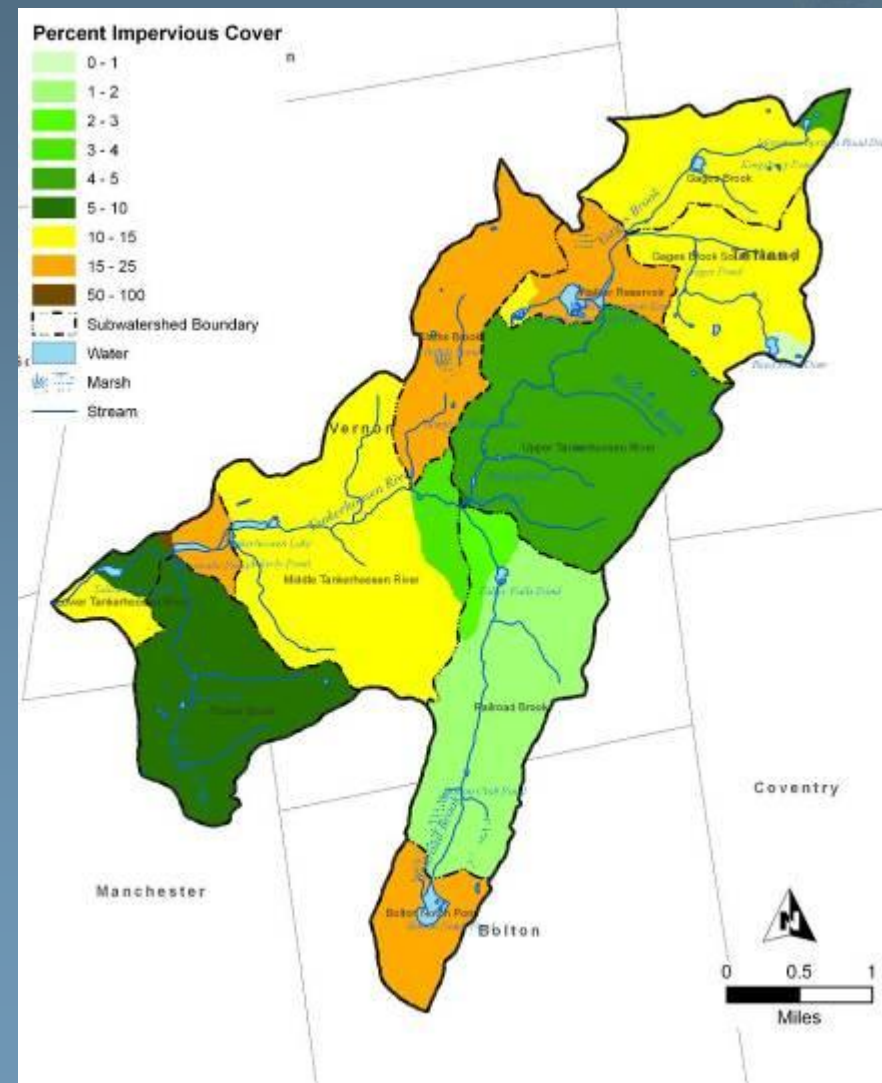
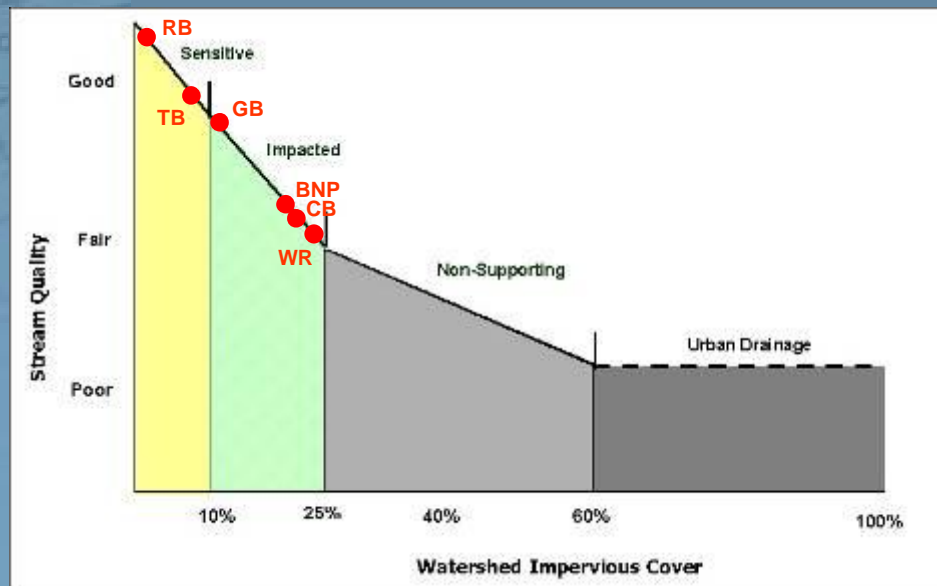
- 55% of watershed is forested
- Subwatersheds: 31% to 86%
- 65% literature threshold for healthy aquatic invertebrate community
- 40% threshold goal for urban areas
- Significant “developable” forest cover

Subwatershed Name	Forest Cover in Subwatershed (acres)	Percent Forest Cover in each Subwatershed	Developable Forest Cover in Subwatershed (acres)	Percent of Forest Cover that is Developable
Bolton Notch Pond	171	49.6 %	41	24.0 %
Clarks Brook	226	34.8 %	70	30.9 %
Gages Brook	314	45.2 %	134	42.6 %
Gages Brook South Tributary	395	58.1 %	171	43.3 %
Lower Tankerhoosen River	149	46.6 %	82	54.9 %
Middle Tankerhoosen River	625	39.6 %	122	19.6 %
Railroad Brook	1043	86.3 %	346	33.2 %
Tucker Brook	374	40.0 %	119	31.8 %
Upper Tankerhoosen River	1110	75.4 %	278	25.0 %
Walker Reservoir	109	31.3 %	54	49.2 %
<b>Tankerhoosen River Watershed</b>	<b>4515</b>	<b>54.9 %</b>	<b>1416</b>	<b>31.4 %</b>



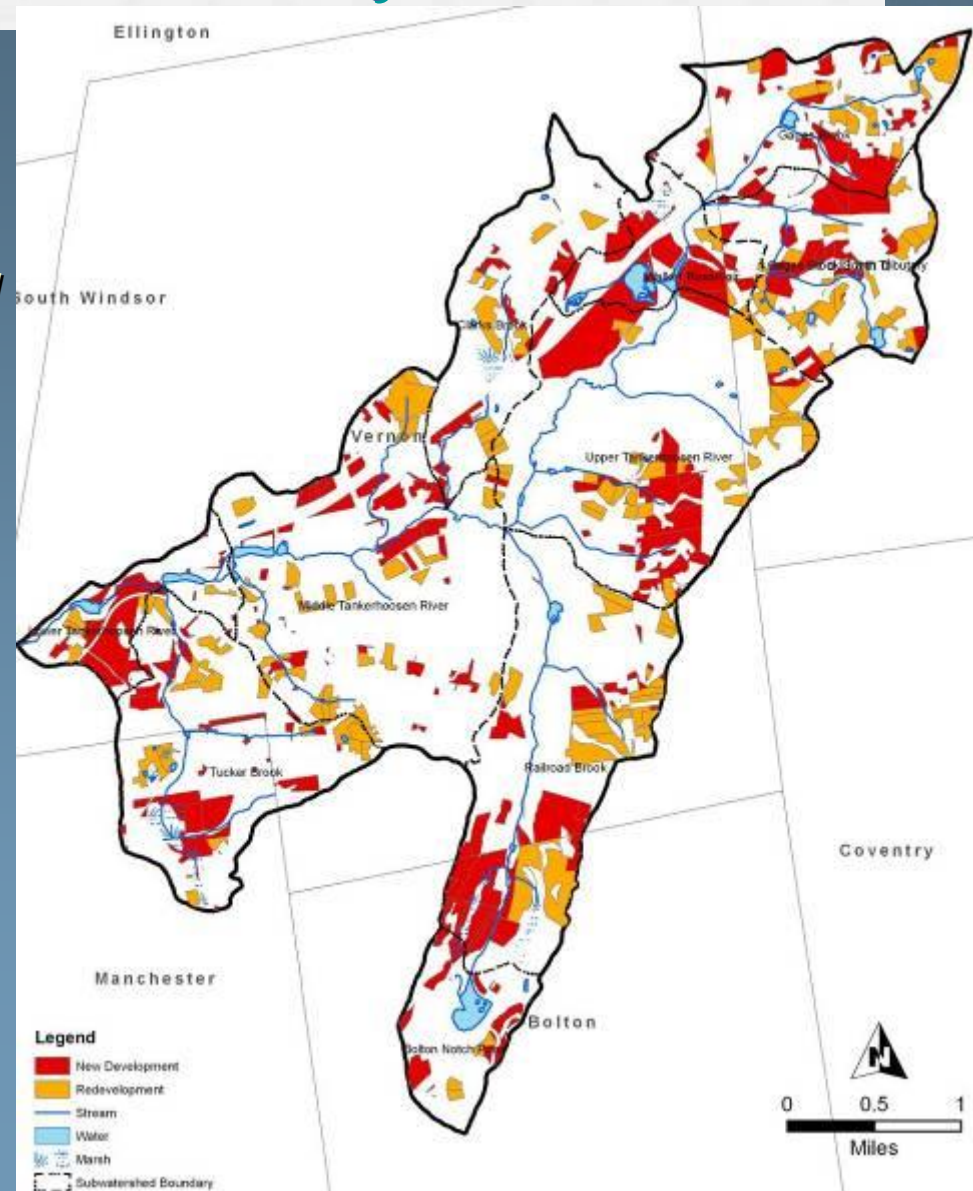
# Impervious Cover

- 2002 satellite imagery
- Overall watershed IC is 9.7%
- Gages Brook IC at 11.5%
- Impervious Cover Model
- Statewide impairment threshold of 12%



# Watershed Buildout Analysis

- Potential full buildout of watershed
- Developable land
  - *New development (undeveloped and uncommitted open space)*
  - *Redevelopment (large lot residential that could be further subdivided)*
  - *Water bodies, wetlands, and steep slope soils excluded*
- Assign future land use of developable land based on zoning
- 15% increase in residential
- 3% increase in commercial/industrial
- 14% decrease in undeveloped and uncommitted open space





# Future Impervious Cover

- Future IC estimated using land cover coefficients
- Watershed-wide IC predicted to increase from 9.8% to 12.5 %
- Cross or approach “sensitive” threshold (10-12%):
  - *Gages Brook, Gages Brook South Tributary, Tucker Brook*
- Cross or approach “impacted” threshold (25%):
  - *Lower Tankerhoosen River, Walker Reservoir*

Subwatershed	Existing Percent Impervious Cover	Future Percent Impervious Cover	Percent Change (IC <sup>Future</sup> – IC <sup>Existing</sup> )
Bolton Notch Pond	16.6 %	18.9 %	2.3 %
Clarks Brook	17.2 %	20.6 %	3.4 %
Gages Brook	11.5 %	14.2 %	2.7 %
Gages Brook South Tributary	11.3 %	13.5 %	2.2 %
Lower Tankerhoosen River	15.8 %	23.0 %	7.2 %
Middle Tankerhoosen River	12.9 %	15.5 %	2.6 %
Railroad Brook	1.7 %	3.4 %	1.7 %
Tucker Brook	8.1 %	10.3 %	2.2 %
Upper Tankerhoosen River	4.5 %	4.7 %	0.2 %
Walker Reservoir	19.9 %	29.13 %	9.2 %
<b>Total</b>	<b>9.87 %</b>	<b>12.47 %</b>	<b>2.6 %</b>

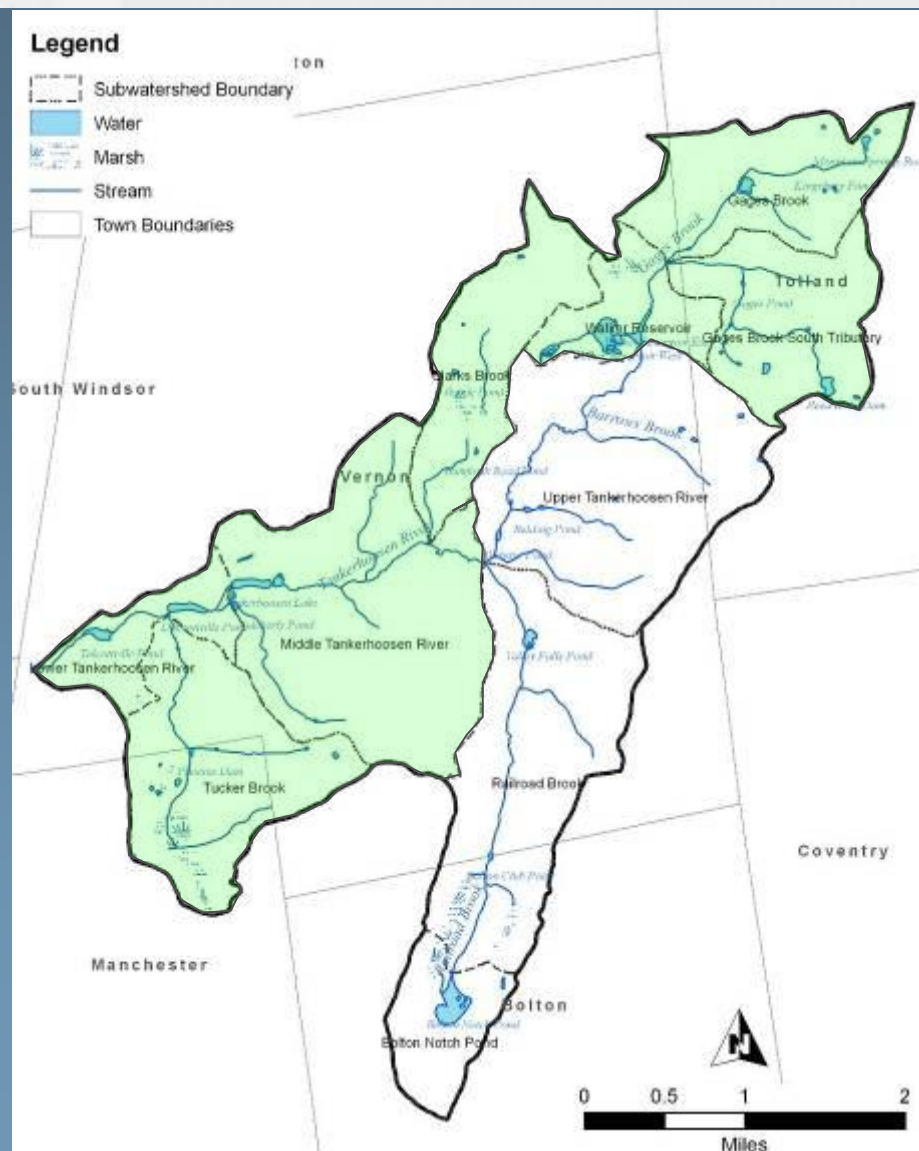


# Watershed Field Inventories

- Streams (*streamwalk surveys*):
  - *Stream Corridor and Habitat Assessment*
- Upland Source Areas (*windshield surveys*):
  - *Neighborhood Source Assessment*
  - *Hotspot Site Investigation*
- Stormwater Management (*windshield surveys and site walks*):
  - *Streets and Storm Drain Assessment*
  - *Stormwater Retrofit Inventory*

# Priority Subwatersheds

- Field inventories performed in priority subwatersheds
- 8.7 miles of streams assessed
- June 3-6, July 2, and July 10 stream surveys
- Efforts targeted at stream segments and upland areas with greatest potential stream impacts



# Field Data Collection Methods

- CWP (and EPA) Watershed Assessment Techniques
- Stream Assessment Training
- Completed for Each Reach
  - *General Information (fill out at start of reach)*
  - *Reach Sketch (sketch as you go)*
  - *Average Conditions (describe as you go)*
  - *Evaluation of 8 stream corridor habitat parameters (assign scores at end of reach)*
- Complete Applicable Site Impact Forms
- Field Data Entered into Database

# Field Data Forms

Reach Level Assessment

**RCH**

SURVEY REACH ID: <u>GR-02</u>		WTRSHD/SUBSHD: <u>Gates Brook</u>		DATE: <u>6/3/08</u>	ASSESSED BY: <u>TEAM/ALC</u>
START TIME: <u>10:30 AM/PM</u>	LMK: <u></u>	END TIME: <u></u>	LMK: <u></u>	GPS ID: <u></u>	
LAT <u>41° 51' 26.1"</u> LONG <u>72° 25' 29.4"</u>		LAT <u>41° 51' 32.9"</u> LONG <u>72° 25' 24.2"</u>			
DESCRIPTION: <u>FOOTBRIDGE @ JAC</u>		DESCRIPTION: <u>BATES WIRE FENCE</u>			

RAIN IN LAST 24 HOURS	<input type="checkbox"/> Heavy rain	<input type="checkbox"/> Steady rain	<input type="checkbox"/> Intermittent	<input checked="" type="checkbox"/> None	<input type="checkbox"/> Intermittent	<input type="checkbox"/> Trace
PRESENT CONDITIONS			<input type="checkbox"/> Heavy rain	<input type="checkbox"/> Steady rain	<input type="checkbox"/> Intermittent	<input type="checkbox"/> Overcast
			<input type="checkbox"/> Trace	<input type="checkbox"/> Overcast	<input type="checkbox"/> Partly cloudy	
SURROUNDING LAND USE:			<input type="checkbox"/> Industrial	<input type="checkbox"/> Commercial	<input type="checkbox"/> Urban/Residential	<input type="checkbox"/> Suburban/Res
			<input type="checkbox"/> Golf course	<input type="checkbox"/> Park	<input type="checkbox"/> Crop	<input type="checkbox"/> Pasture
			<input checked="" type="checkbox"/> Forested	<input type="checkbox"/> Institutional	<input checked="" type="checkbox"/> Wetland	

AVERAGE CONDITIONS (check applicable)		REACH SKETCH AND SITE IMPACT TRACKING	
BASE FLOW AS %	<input type="checkbox"/> 0-25% <input checked="" type="checkbox"/> 50%-75% <input type="checkbox"/> 75-100%	Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB, SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow.	
CHANNEL WIDTH	<input type="checkbox"/> 0-25% <input checked="" type="checkbox"/> 50%-75% <input type="checkbox"/> 75-100%		

DOMINANT SUBSTRATE		WATER CLARITY	
<input type="checkbox"/> Silt/clay (fine or slick)	<input checked="" type="checkbox"/> Gravel (0.1-2.5")	<input checked="" type="checkbox"/> Clear	<input type="checkbox"/> Turbid (suspended matter)
<input type="checkbox"/> Sand (gritty)	<input type="checkbox"/> Boulder (>10")	<input type="checkbox"/> Stained (clear, naturally colored)	<input type="checkbox"/> Opaque (milky)
<input type="checkbox"/> Bed rock		<input type="checkbox"/> Other (chemicals, dyes)	

AQUATIC PLANTS		WILDLIFE IN OR AROUND STREAM	
Attached:	<input type="checkbox"/> none <input type="checkbox"/> some <input checked="" type="checkbox"/> lots	(Evidence of)	<input type="checkbox"/> Fish <input type="checkbox"/> Beaver <input checked="" type="checkbox"/> Deer <input type="checkbox"/> Snails <input type="checkbox"/> Other: <u>racoon, bird</u>
Floating:	<input type="checkbox"/> none <input type="checkbox"/> some <input checked="" type="checkbox"/> lots		

STREAM SHADING (water surface)		CHANNEL DYNAMICS	
<input checked="" type="checkbox"/> Mostly shaded (>75% coverage)	<input type="checkbox"/> Halfway (>50%)	<input type="checkbox"/> Downcutting	<input type="checkbox"/> Bed scour
<input type="checkbox"/> Partially shaded (>25%)	<input type="checkbox"/> Unshaded (<25%)	<input type="checkbox"/> Widening	<input type="checkbox"/> Bank failure
		<input type="checkbox"/> Headcutting	<input type="checkbox"/> Bank scour
		<input type="checkbox"/> Aggrading	<input type="checkbox"/> Slope failure
		<input checked="" type="checkbox"/> Sed. deposition	<input type="checkbox"/> Channelized

CHANNEL DIMENSIONS (FACING DOWNSTREAM)		REACH ACCESSIBILITY	
Height: LT bank	<u>2</u> (ft)	Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	Fair: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.
Width: Bottom	<u>6</u> (ft)		Difficult: Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.
Top	<u>10</u> (ft)		

CHANNEL DYNAMICS		REACH ACCESSIBILITY	
<input type="checkbox"/> Unknown	<input checked="" type="checkbox"/> Sed. deposition		

CHANNEL DIMENSIONS (FACING DOWNSTREAM)		REACH ACCESSIBILITY	
Height: LT bank	<u>2</u> (ft)		
Width: Bottom	<u>6</u> (ft)		
Top	<u>10</u> (ft)		

CHANNEL DIMENSIONS (FACING DOWNSTREAM)		REACH ACCESSIBILITY	
Height: LT bank	<u>2</u> (ft)		
Width: Bottom	<u>6</u> (ft)		
Top	<u>10</u> (ft)		

CHANNEL DIMENSIONS (FACING DOWNSTREAM)		REACH ACCESSIBILITY	
Height: LT bank	<u>2</u> (ft)		
Width: Bottom	<u>6</u> (ft)		
Top	<u>10</u> (ft)		

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Height: LT bank	<u>2</u> (ft)		
Width: Bottom	<u>6</u> (ft)		
Top	<u>10</u> (ft)		

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Height: LT bank	<u>2</u> (ft)		
Width: Bottom	<u>6</u> (ft)		
Top	<u>10</u> (ft)		

CHANNEL DIMENSIONS (FACING DOWNSTREAM)		REACH ACCESSIBILITY	
Height: LT bank	<u>2</u> (ft)		
Width: Bottom	<u>6</u> (ft)		
Top	<u>10</u> (ft)		

REPORTED TO AUTHORITIES ☐ Yes ☐ No

## OVERALL STREAM CONDITION

	Optimal	Suboptimal	Marginal	Poor
<b>IN-STREAM HABITAT</b>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of rewall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
(May modify criteria based on appropriate habitat regime)	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>VEGETATIVE PROTECTION</b>	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
(score each bank, determine sides by facing downstream)	Left Bank 10 9 Right Bank 10 9	8 7 6 8 7 6	5 4 3 5 4 3	2 1 0 2 1 0
<b>BANK EROSION</b> (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion, likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure.	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9 Right Bank 10 9	8 7 6 8 7 6	5 4 3 5 4 3	2 1 0 2 1 0
<b>FLOODPLAIN CONNECTION</b>	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) not able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

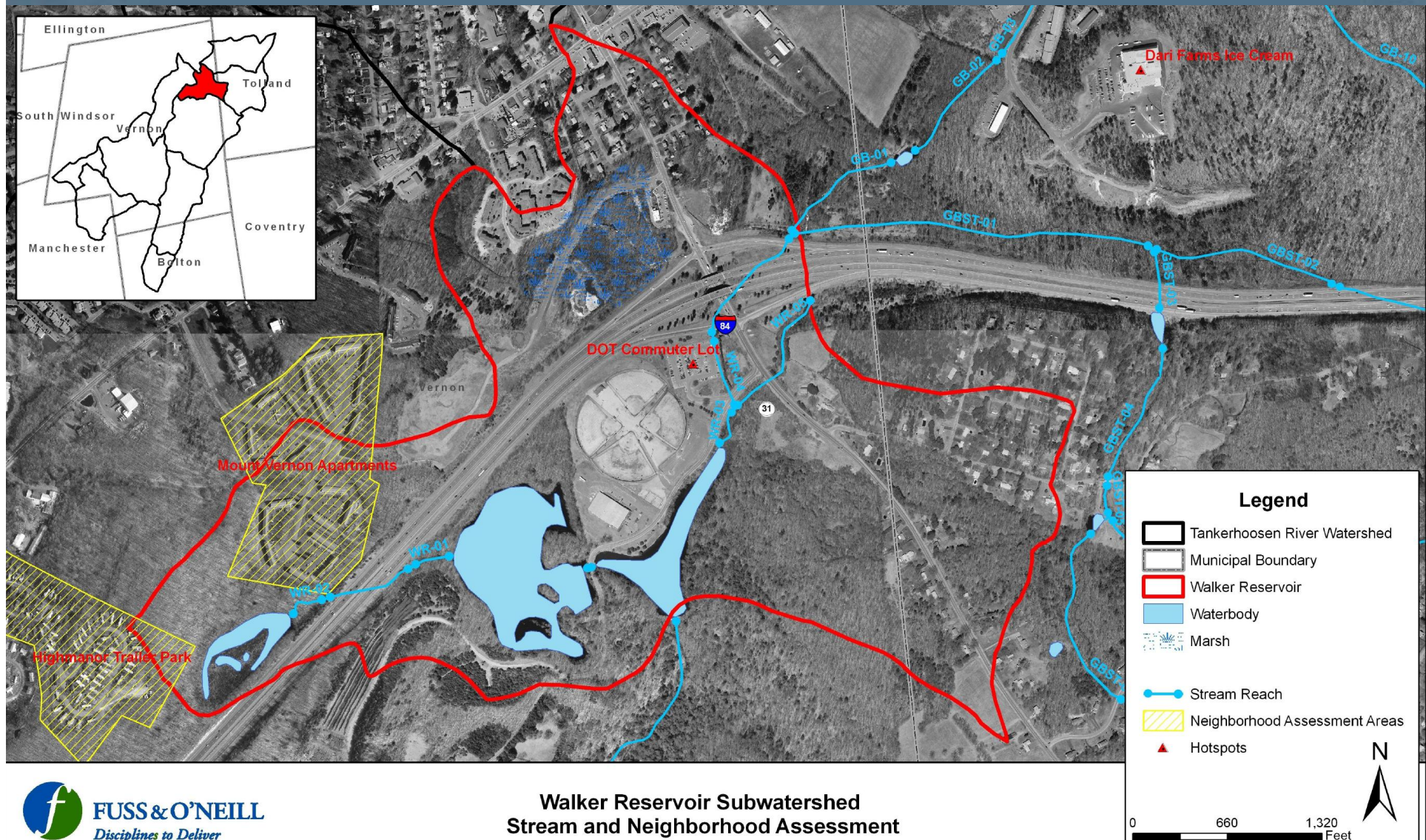
## OVERALL BUFFER AND FLOODPLAIN CONDITION

	Optimal	Suboptimal	Marginal	Poor
<b>VEGETATED BUFFER WIDTH</b>	Width of buffer zone >50 feet; human activities (i.e., parking lots, roads, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet; little or no riparian vegetation due to human activities.
	Left Bank 10 9 Right Bank 10 9	8 7 6 8 7 6	5 4 3 5 4 3	2 1 0 2 1 0
<b>FLOODPLAIN VEGETATION</b>	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>FLOODPLAIN HABITAT</b>	Even mix of wetland and non-wetland habitats, evidence of standing/pooled water	Even mix of wetland and non-wetland habitats, no evidence of standing/pooled water	Either all wetland or all non-wetland habitat, evidence of standing/pooled water	Either all wetland or all non-wetland habitat, no evidence of standing/pooled water
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>FLOODPLAIN ENCROACHMENT</b>	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not affecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures. Significant effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Sub Total In-stream:        /80 + Buffer/Floodplain:        /80 = Total Survey Reach        /160



# Reach Mapping



# Impact Conditions Evaluated

- Outfalls (OT)
- Severe Bank Erosion (ER)
- Impacted Buffer (IB)
- Utilities in Stream Corridor (UT)
- Trash and Debris (TR)
- Stream Crossings (SC)
- Channel Modification (CM)
- Miscellaneous (MI)



# Summary of Findings

- Overall conditions of stream/riparian corridor were mixed

Table 4: Stream Reach Assessment Scores and Classifications

Excellent		Good		Fair		Poor		Very Poor	
Reach ID	Score	Reach ID	Score	Reach ID	Score	Reach ID	Score	Reach ID	Score
MTR-08	153	GBST-02	127	GB-09	114	TB-04B	83	GB-05B	53
GB-10	146	GB-02	120	GBST-03	111	MTR-01	82	WR-01	35
GBST-04A	146	GBST-09B	120	LTR-03	111	GB-04	80		
GBST-01	145	TB-02	119	GB-07	105	WR-02	80		
MTR-07	139	GBST-04B	117	CB-03	104	WR-04	76		
CB-04	138	TB-01	116	GB-01	102	GB-03B	72		
		GB-08	115	GB-03A	97	GBST-09A	59		
				MTR-09	94				
				GB-05A	93				
				CB-02	93				
				TB-03	92				
				TB-04A	92				
				WR-03	91				
				GB-06	88				
				MTR-02	87				
				CB-01	85				
				WR-05	84				

Note: TB04C and CB-05 were not scored during the reach level assessment

# In-Stream Habitat

- In-stream habitat mixed, even in same subwatershed



- Majority of reaches appear to support biological communities (fish, frogs, birds)



# Fish Passage

- Many potential barriers to fish passage
  - *Perched culverts, culverts with shallow flow, dams*





# Stream Buffer Encroachments

- Stream buffer encroachments common
  - *Residential, commercial areas*





# Residential Runoff

- Residential areas contribute significant runoff
  - *Medium and high density neighborhoods with small yards*
  - *Many outfall pipes to stream (foundation drains, yard drains, downspouts)*
  - *Little or no stream buffer*



# Parking Lots

- Potential candidates for stormwater retrofits





# Inadequate Stormwater Management

- Many residential developments pre-date modern stormwater controls
- Traditional curb and gutter and closed drainage systems
- No LID design practices observed
- Existing stormwater management systems not being maintained
- Untreated runoff from roads and highways

# Traditional Curb and Gutter Drainage





# Untreated Roadway Runoff

- Source of sediment and other pollutants





# Streambank Erosion

- Relatively isolated areas of moderate to severe bank erosion
- Most located at or downstream of stormwater outfalls
- Limited access





# Trash and Debris

- Stream cleanup candidates



# Plan Objectives

1. Build a foundation for implementing the plan
2. Enhance in-stream and riparian habitat
3. Protect/restore riparian buffers
4. Identify and eliminate illicit discharges
5. Residential management practices
6. Municipal and business management practices
7. Implement water quality monitoring program
8. Protect open space
9. Promote LID and sustainable site design
10. Assess additional subwatersheds

# Recommendations Framework

- Scale and location
  - *Watershed-wide*
  - *Targeted*
  - *Site-specific*
- Priority
  - *Short-term (1-2 years)*
  - *Mid-term (2-4 years)*
  - *Long-term (5-10 years)*

# Watershed-Wide Recommendations

- Municipal stormwater regulations and design guidance
- Municipal stormwater programs
- Watershed stewardship signage
- Residential rooftop disconnection
- Education and outreach
- Water quality monitoring



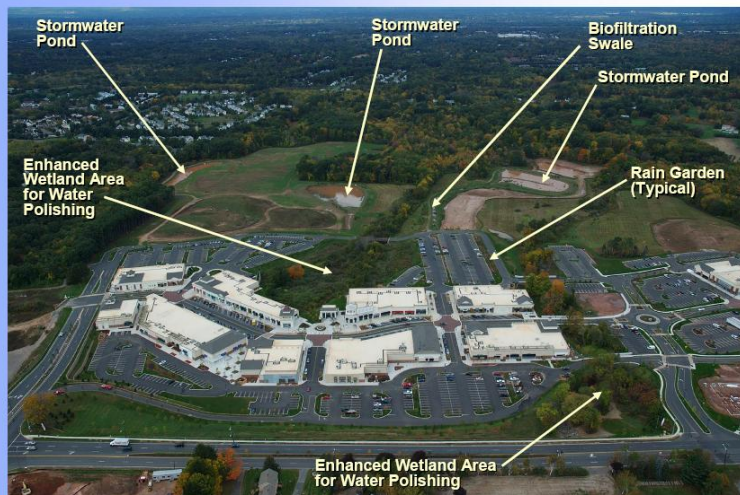
# Municipal Regulations

- Detailed land use regulatory review completed
- Tolland
  - *Adopted comprehensive LID regulations in 2008*
  - *Good local model for the other watershed towns*



# What is LID?

## *The Promenade Shops at Evergreen Walk* South Windsor, CT



Fuss & O'Neill provided land development and survey services for The Shops at Evergreen Walk, which is the first phase of a 244 acre lifestyle center development. Evergreen Walk is made up of retail, office, hotel and health club space, plus wellness facilities and high-end housing. The Shops were developed on 40 acres of mixed-use land. The retail stores and dining areas opened for business in 2005.

## Conservation Subdivision



## Typical Subdivision



## Grass Drainage Swales



## Parking Lot Bioretention



## Rain Barrels



# Why Do We Need LID?

- Conventional Strategies Aren't Working
  - *Increased runoff & decreased recharge*
  - *Loss of vegetation and wildlife habitat*
  - *Loss of community character*
  - *Polluted waterways*
  - *Cost of development*



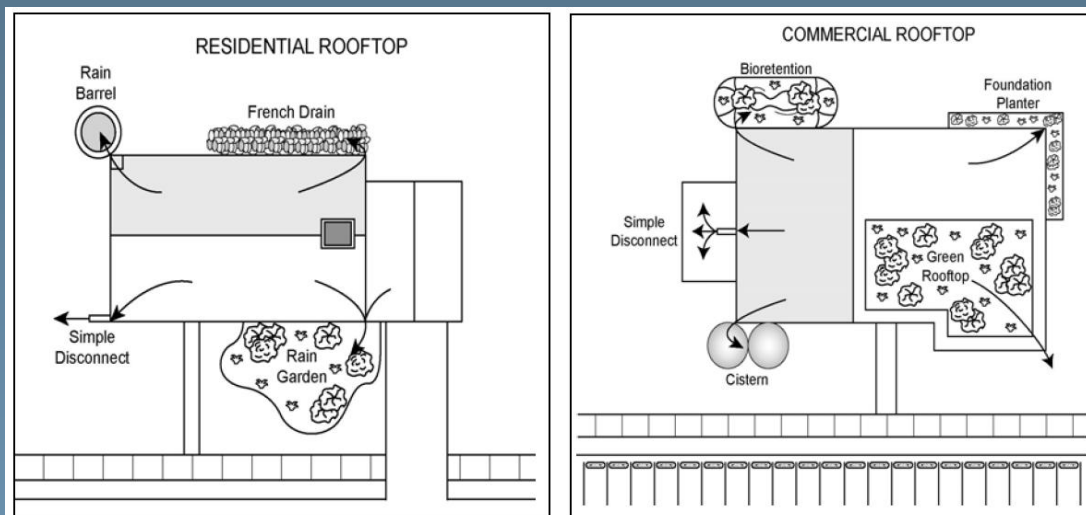


# Recommendations for Vernon

- Develop a Town stormwater and LID design manual
- Develop stormwater management standards
- Develop new or modified stormwater regulations
- Amend other existing regulations
  - *Subdivision, zoning, inland wetlands*

# Residential Rooftop Disconnection

- Residential areas contribute large quantity of runoff to storm drainage system



- Require LID and rooftop disconnection for new projects
- Disconnection retrofit program

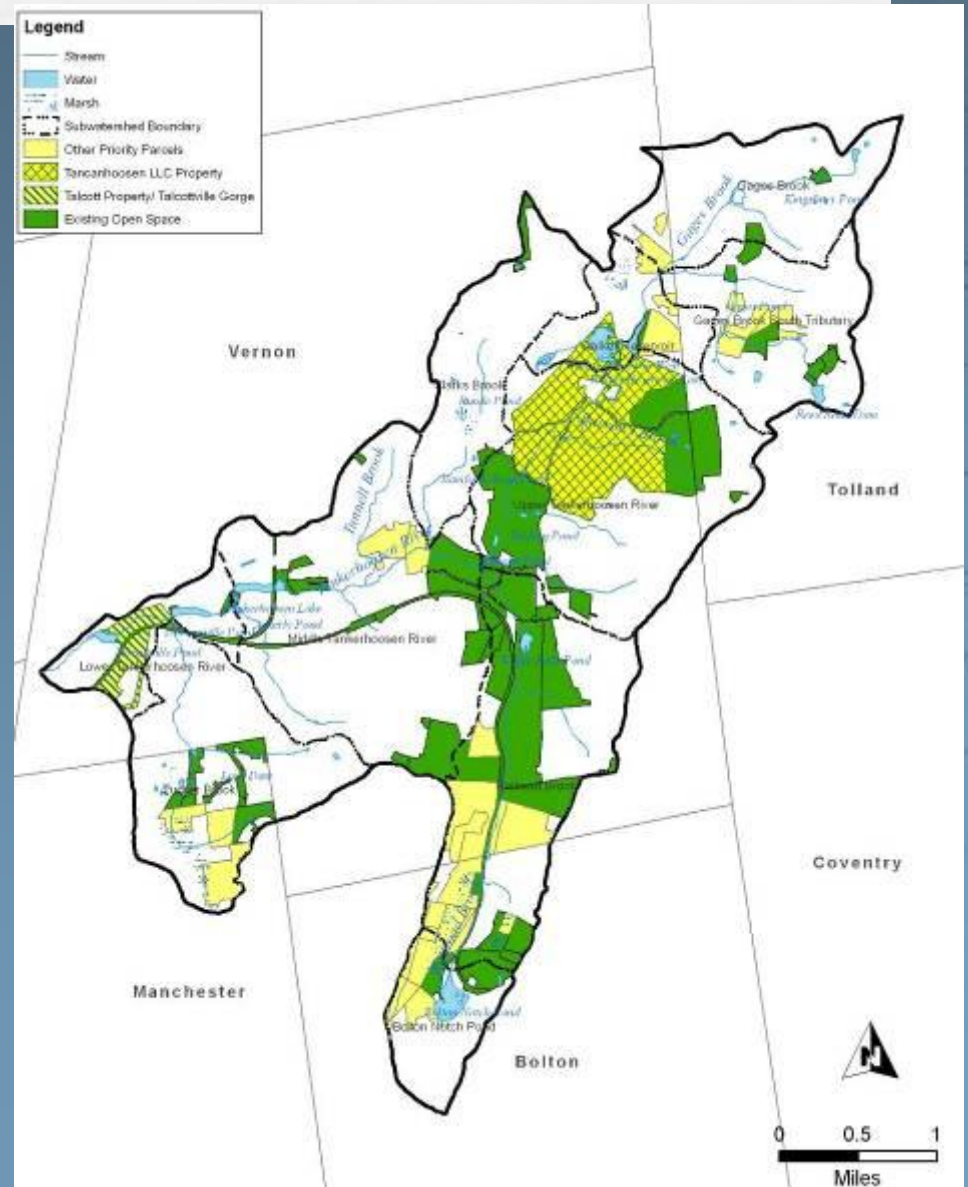
# Targeted Recommendations

- Priority open space protection
- Invasive plant species management
- Targeted stormwater outfall retrofits
- Watershed fish passage assessment
- Targeted illicit discharge investigations
- Additional subwatershed field inventories



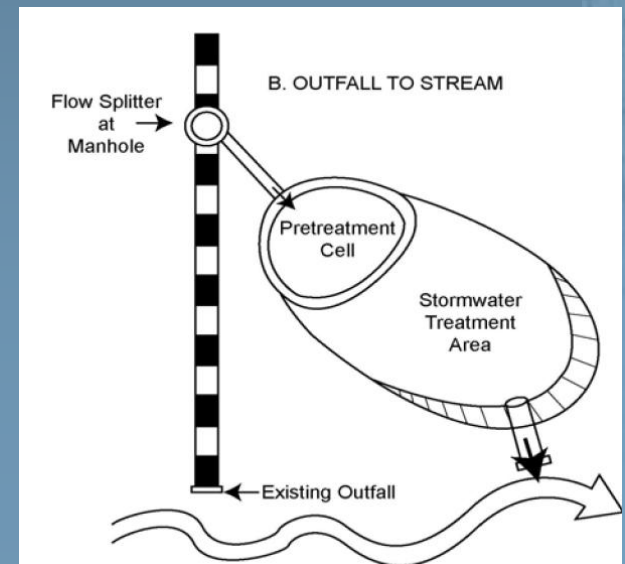
# Open Space Protection

- Preservation of key parcels as open space
- Town Open Space Plans
- Tancanhoosen, LLC
- Talcottville Gorge



# Stormwater Outfall Retrofits

- Untreated road runoff
- Source of sediment and pollutants
- Opportunity to retrofit existing outfalls
- Plan identifies potential outfall retrofit candidates
- Need further site-specific evaluation to verify feasibility



# Fish Passage Barrier Assessment

- Many existing and potential barriers to fish passage
- Field inventory along Upper Tankerhoosen
  - *Proposed removal of Belding Pond Dam could provide for additional passage to Walker Reservoir*
- Evaluate Lower Tankerhoosen
  - *Presence of American eel and other resident fish populations*
  - *Include fish passage provisions with future dam repairs*





# Site-Specific Recommendations

- Stormwater retrofits
- Riparian buffer restoration
- Stream bank restoration
- Evaluation of selected dams
- Aquatic invasive species study
- Priority stream cleanups

# Site-Specific Stormwater Retrofits

- 10 retrofit sites identified
- Generally on publicly-owned land with significant impervious area
- Representative of the type of retrofit opportunities that exist throughout the watershed

## Sites

1. *Northeast School*
2. *Mount Vernon Apartments*
3. *Fire Station*
4. *Vernon Historical Society*
5. *ConnDOT Commuter Lots (2)*
6. *Lake Street School*
7. *Gerber Technologies Office Building*
8. *Tankerhoosen Lake (2)*

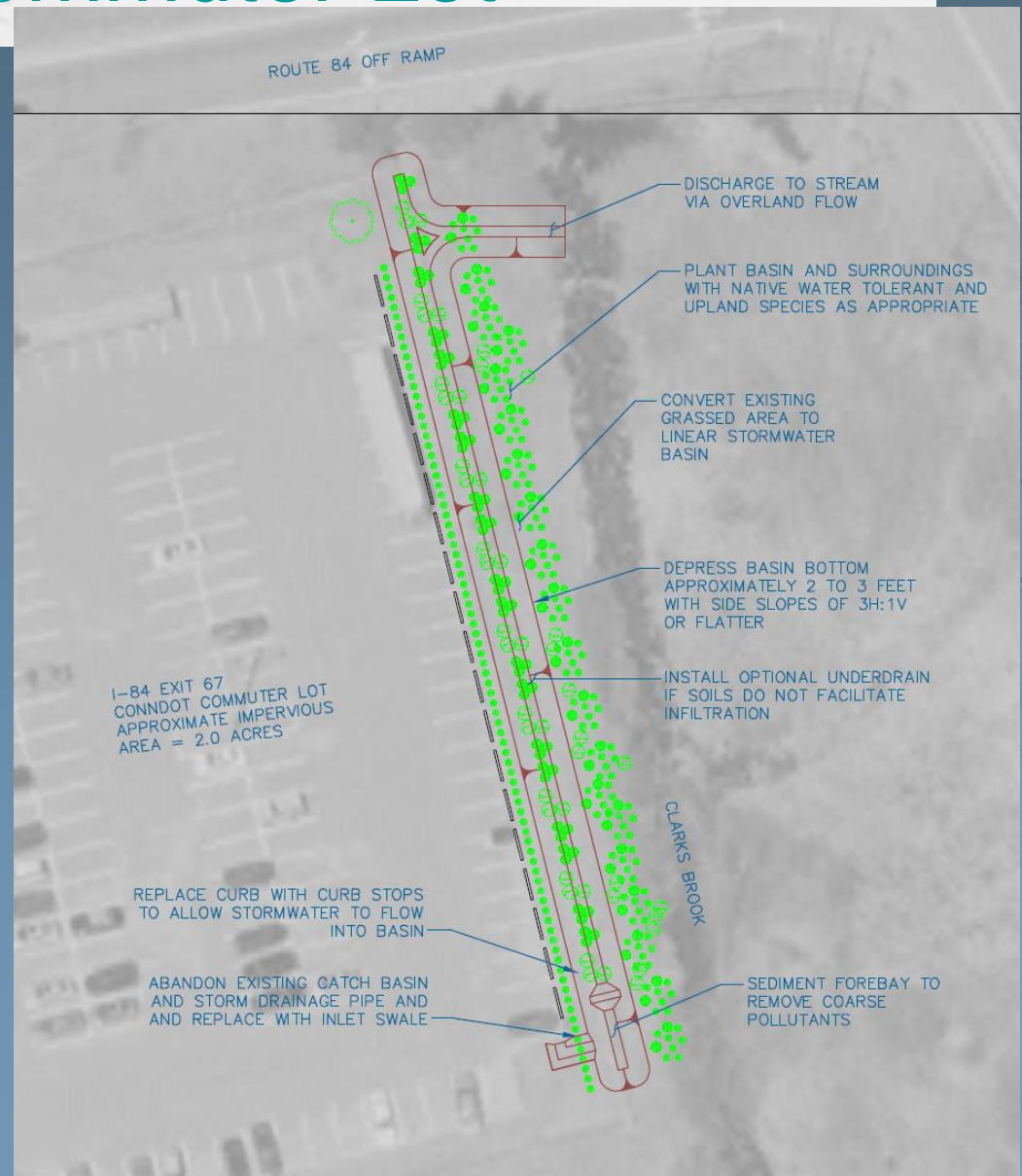
# I-84 Exit 67 Commuter Lot





# I-84 Exit 67 Commuter Lot

- Install narrow bioretention basin and sediment forebay
- Cost estimated at \$53,000



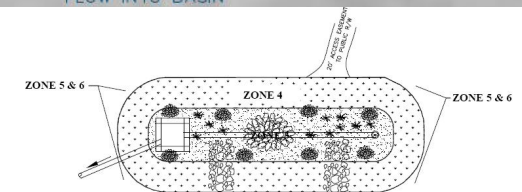
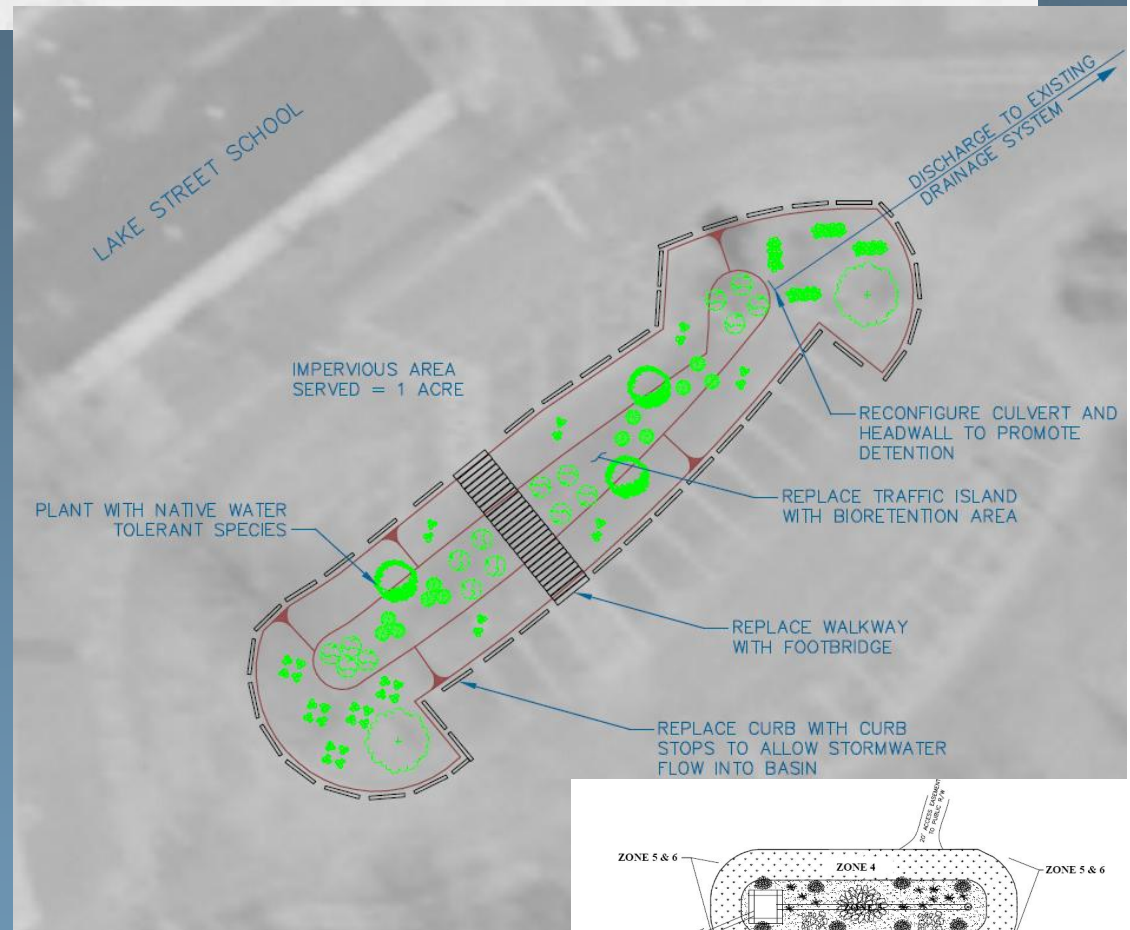
# Lake Street School





# Lake Street School

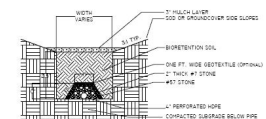
- Convert existing traffic island to bioretention/rain garden
- Ideal demonstration project
- Cost estimated at \$94,000



PLAN

## NOTES

1. PLANTING ZONES AND PLANT SELECTION FOR DETAIL SHEET 7
2. ALL PLANTING SHALL BE LOCAL NATIVE SPECIES
3. IRRIGATION MAY BE PROVIDED FOR INITIAL ESTABLISHMENT AND DRY SEASONS





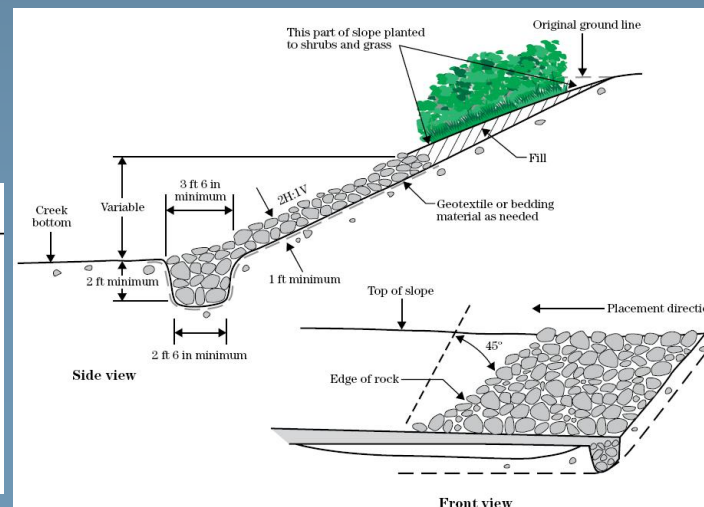
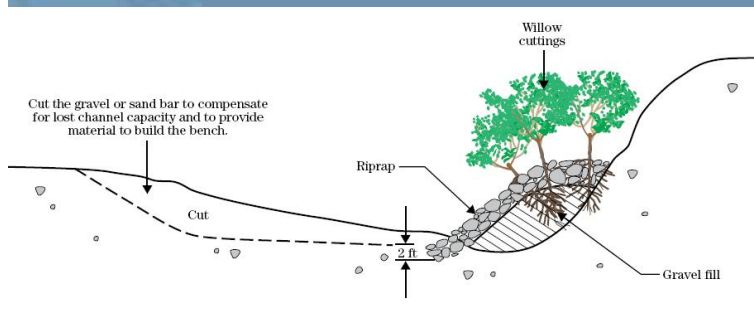
# Riparian Buffer Restoration

- Stream buffer encroachments common
- Residential and commercial lawns, historical mill development
- 10 to 15 candidate sites identified
  - *Install new buffers*
  - *Widen existing buffer*
  - *Invasive species removal*
  - *Tree planting/reforestation*
- Sites need further evaluation



# Stream Bank Restoration

- Isolated areas of moderate to severe bank erosion
- 15 priority bank restoration sites identified
- Typical restoration techniques:
  - *Slope stabilization*
  - *Toe protection*
  - *Bioengineering*





# Aquatic Invasive Species Study

- Valley Falls Pond
  - *Variable leaf milfoil*
  - *Aquatic plant survey and feasibility study*
- Walker Reservoir
  - *Fanwort*
  - *Aquatic plant survey*
  - *Additional WQ study of Walker Reservoir*
    - *Better understand the link between water quality of the reservoir and the Tankerhoosen River*
    - *Management recommendations for Walker Reservoir*





# Plan Implementation

- Expand the Technical Advisory Committee into a sustainable “coalition” of partners
  - *Include town representatives*
  - *Formal adoption of plan by the watershed towns*
- Identify funding sources
  - *Plan identifies long list of potential sources*
- Prepare and submit grant applications for projects identified in the plan

# Questions and Comments